

29-OCT-09  
10:43:47

GEORGIA DEPARTMENT OF TRANSPORTATION  
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN  
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM  
REVISED: JUNE 30, 2008  
36' CURB-CURB; 5 BEAMS; 140' SPAN; 60' TALL; BRIDGE 26 ; PIER 6

PROB. NO. 0001

DESIGN DATA												DESIGN DATA														
DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C PSI	FC PSI	N	FY PSI	FS PSI	DESIGN EC KSI	ES KSI	CONC. STRAIN	Z FACT	* MAIN SIZE	* STR SIZ	* CAP MAX TOP	REINFORCING MAX BOT	STEEL MIN SIZE	* MIN NO.	* TOP CL.	* MIN S.SP	* CAP INCR.	* CAP BOT CL.		
D	D	D	L	2	1	12	0-00-00	3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00
COLUMN MIN.P	REINFORCING MAX.P	STEEL CL.SP	STEEL CLEAR	R MODE	KL COEF	OC	OF	CM	BD1	BD2	IMPACT %	SOIL KCF	WT KSF	ALL.S.P.	MIN PL SP	MAX PL SP	EDGE DIST	PILE DEPTH	REBAR CLEAR	ALL.PILE CAPACITY	PILE UPLIFT	ALL.PILE INCR.	PILE BOT CL.			
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	18.87	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999						

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	19.625	4.000	4.000	6.000	6.000	4.000	15.625	16.000	8.000	4.000					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	1	C	T		60.000	0.000	8.000	6.000	8.000	6.000	6.000	0.000	8	6	11	8	6	11	22	16	11	22	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.	
31	P	10.000	10.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000	
GROUP II WIND INTENSITIES																
WIND TRANS.	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* WIND ON APT	* FORCE APL	* ARM APL	* WIND ON PT	PIER PL	
1365.	2730.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	7.676	17.595

GROUP III WIND

STD. WIND	* FT1	WIND ON FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* STD. WIND	* FT1	WIND ON FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* LENGTHS OF TRANS.	LL LONGI.	* WIND ON APT	LL APL		
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	140.0	280.0	15.583	15.583

MISCELLANEOUS FORCES

CENTRI. FT	TRACTION FL	FORCE APT	AND ARMS APL	EXPANSION COEFFICIENT	SHRINKAGE COEFFICIENT	STREAM PT	FLOW PL
3.908	9.860	15.583	15.583	0.00018000	0.00044000	0.000	0.000

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	281.621	325.334	0.000	325.334	0.000	325.334	281.621					
LL 1	1	85.882	51.529	0.000	0.000	0.000	0.000	0.000					
LL 2	2	85.882	103.059	0.000	85.882	0.000	0.000	0.000					
LL 3	3	85.882	103.059	0.000	120.235	0.000	85.882	17.176					
LL 4	1	0.000	0.000	0.000	0.000	0.000	51.529	85.882					
LL 5	2	0.000	0.000	0.000	85.882	0.000	103.059	85.882					
LL 6	3	17.176	85.882	0.000	120.235	0.000	103.059	85.882					
LL 7	1	0.000	25.764	0.000	85.882	0.000	25.764	0.000					
LL 8	2	42.941	111.647	0.000	94.470	0.000	25.764	0.000					
LL 9	3	42.941	111.647	0.000	103.059	0.000	111.647	42.941					
LL10	2	0.000	85.882	0.000	103.059	0.000	85.882	0.000					
LL11	2	85.882	51.529	0.000	0.000	0.000	51.529	85.882					
LL12	3	85.882	103.059	0.000	85.882	0.000	51.529	85.882					

COLUMN MOMENTS(KIP- FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE

\* LONGITUDINAL

LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	60.000	0.000	0.000	0.000	6.000	1.000	60.000	60.000
DEAD LOAD TOTAL	1	1765.594 2154.394	0.000	0.000	0.000	2154.394	8089.646	-8089.646	0.000	0.000	0.000	0.000
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-212.808	-9.860	-745.248	-745.248
CENT. FORCE 1 LN	1	0.000	-84.346	3.908	295.378	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WIND ON SUBSTR.	1	0.000	-46.056	7.676	460.560	0.000	0.000	0.000	-105.570	-17.595	-1055.700	-1055.700
GROUP 2 WIND 1 1	1	0.000	-958.900	75.926	5058.904	0.000	0.000	0.000	-105.570	-17.595	-1055.700	-1055.700
GROUP 2 WIND 1 2	1	0.000	-958.900	75.926	5058.904	0.000	0.000	0.000	105.570	17.595	1055.700	1055.700
GROUP 2 WIND 2 1	1	0.000	-849.359	67.736	4507.103	0.000	0.000	0.000	-324.653	-33.975	-2159.302	-2159.302

PIER-36-5-140-60.OUT																
GROUP	WIND	2	2	1	0.000	-849.359	67.736	4507.103	0.000	0.000	0.000	324.653	33.975	2159.302	2159.302	
GROUP 2	WIND	3	1	1	0.000	-794.588	63.641	4231.202	0.000	0.000	0.000	-543.735	-50.355	-3262.905	-3262.905	
GROUP 2	WIND	3	2	1	0.000	-794.588	63.641	4231.202	0.000	0.000	0.000	543.735	50.355	3262.905	3262.905	
GROUP 2	WIND	4	1	1	0.000	-648.533	52.721	3495.467	0.000	0.000	0.000	-689.790	-61.275	-3998.640	-3998.640	
GROUP 2	WIND	4	2	1	0.000	-648.533	52.721	3495.467	0.000	0.000	0.000	689.790	61.275	3998.640	3998.640	
GROUP 2	WIND	5	1	1	0.000	-356.423	30.881	2023.997	0.000	0.000	0.000	-799.331	-69.465	-4550.441	-4550.441	
GROUP 2	WIND	5	2	1	0.000	-356.423	30.881	2023.997	0.000	0.000	0.000	799.331	69.465	4550.441	4550.441	
GROUP 3	WIND	1	1	1	0.000	-589.832	36.778	2575.833	0.000	0.000	0.000	-31.671	-5.279	-316.710	-316.710	
GROUP 3	WIND	1	2	1	0.000	-589.832	36.778	2575.833	0.000	0.000	0.000	31.671	5.279	316.710	316.710	
GROUP 3	WIND	2	1	1	0.000	-520.710	32.641	2283.313	0.000	0.000	0.000	-169.915	-13.552	-901.750	-901.750	
GROUP 3	WIND	2	2	1	0.000	-520.710	32.641	2283.313	0.000	0.000	0.000	169.915	13.552	901.750	901.750	
GROUP 3	WIND	3	1	1	0.000	-486.149	30.572	2137.053	0.000	0.000	0.000	-308.158	-21.826	-1486.789	-1486.789	
GROUP 3	WIND	3	2	1	0.000	-486.149	30.572	2137.053	0.000	0.000	0.000	308.158	21.826	1486.789	1486.789	
GROUP 3	WIND	4	1	1	0.000	-393.987	25.056	1747.027	0.000	0.000	0.000	-400.321	-27.343	-1876.816	-1876.816	
GROUP 3	WIND	4	2	1	0.000	-393.987	25.056	1747.027	0.000	0.000	0.000	400.321	27.343	1876.816	1876.816	
GROUP 3	WIND	5	1	1	0.000	-209.662	14.024	966.974	0.000	0.000	0.000	-469.442	-31.479	-2169.335	-2169.335	
GROUP 3	WIND	5	2	1	0.000	-209.662	14.024	966.974	0.000	0.000	0.000	469.442	31.479	2169.335	2169.335	
LIVE LOAD	LL	1	1	1	137.411	-1786.344	0.000	1786.344	137.411	1786.344	0.000	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

LOAD	COL	TRANSVERSE								LONGITUDINAL					
		PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF			
LIVE LOAD	LL 2	1	274.823	-2198.584	0.000	2198.584	274.823	2198.584	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 3	1	371.011	-1113.041	0.000	1113.041	371.011	1978.726	-865.685	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 4	1	137.411	1786.344	0.000	-1786.344	137.411	0.000	-1786.344	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 5	1	274.823	2198.584	0.000	-2198.584	274.823	0.000	-2198.584	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 6	1	371.011	1113.041	0.000	-1113.041	371.011	865.685	-1978.726	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 7	1	137.410	0.000	0.000	0.000	137.410	206.112	-206.112	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 8	1	274.822	-1374.120	0.000	1374.120	274.822	1580.232	-206.112	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 9	1	371.011	0.000	0.000	0.000	371.011	1422.209	-1422.209	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL10	1	274.823	0.000	0.000	0.000	274.823	687.056	-687.056	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL11	1	274.822	0.000	0.000	0.000	274.822	1786.344	-1786.344	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL12	1	371.011	-371.016	0.000	371.016	371.011	1978.726	-1607.710	0.000	0.000	0.000	0.000	0.000	0.000

□ CAP ANALYSIS AND DESIGN DATA

POINT	D.L.TOT.	MOMENTS(KIP-FEET)						SHEARS(KIPS)					
		G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT
P 1	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-18.933	-385.040	-18.933	-385.040	-18.933	-571.490
P 2	-3323.512	-3323.512	-4815.111	-3323.512	-3323.512	-3323.512	-4216.685	-440.751	-863.685	-440.751	-863.685	-627.201	-1273.876
P 3	-6846.743	-6846.743	-9979.105	-6846.743	-6846.743	-6846.743	-8722.409	-898.729	-898.729	-898.729	-898.729	-1308.920	-1308.920
C 1L	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699	-936.169		-936.169		-1346.360	
C 1R	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699		936.169		1346.360		936.169
P 5	-6846.743	-6846.743	-9979.104	-6846.743	-6846.743	-6846.743	-8722.409	898.729	898.729	1308.920	1308.920	898.729	898.729
P 6	-3323.512	-3323.512	-4815.110	-3323.512	-3323.512	-3323.512	-4216.685	863.685	440.751	1273.876	627.201	863.685	440.751
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	385.040	18.933	571.490	18.933	385.040	18.933

PT.	UNF.		TOP REINFORCE.		BOT. REINFORCE.		CAP DESIGN DATA				D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO	
	M+	M-	AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN	LEFT STIRRUPS	RIGHT STIRRUPS						
P 1	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	59.14	0.08	0.000	0.099
P 2	-2556.548	-3243.604	13.63	9 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.169D#5@ 7.35	83.71	0.25	0.563	1.210	
P 3	-5266.726	-6709.546	24.80	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00	0.41	0.593	1.040
C 1	-8089.646	-10288.230	38.97	25 # 11	3.12	2 # 11	24.00	0.145	#5@ 4.29	24.00	0.145	#5@ 4.29	96.00	0.63	0.593	0.977
P 5	-5266.726	-6709.545	24.80	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00	0.41	0.593	1.040
P 6	-2556.548	-3243.604	13.63	9 # 11	3.12	2 # 11	24.00	0.169D#5@ 7.35	24.00	0.060	#5@10.33	83.71	0.25	0.563	1.210	
P 7	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	59.14	0.08	0.000	0.099

NOTE: \*\*\* FS/FZ RATIO EXCEEDS 1.0! \*\*\*

PIER-36-5-140-60.OUT

CRITICAL COLUMN LOADS

CN	T	B	GR	LLC	WC	R	E	C	S	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T		1	LL 2	0.0			C		2891.9	-4992.4	0.0	2891.9	6264.0	2616.6	7373.9	15972.7	6672.1	2.550	72.00	96.00
1	B		3	LL 3	4.1			C		3283.0	4754.9	-5055.7	3283.0	5911.2	7485.8	5044.8	9116.4	11544.7	1.542	72.00	96.00

COLUMN DESIGN DATA

CN	T	B	FACE 1	B	FACE 2	D	FACE 3	D	FACE 4	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	3145.	15491.	1.255	1.508	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	3030.	15491.	1.243	1.481	1.000	2	0.70

FOOTING 1 DESIGN LOADS

F	G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
1	3	LL 3	4.1		C		2466.509	3480.900	35.608	-3888.986	-53.965	182.426	56.852	167.154	292.728	171.262	-0.598	42.193	MAX.P1
1	3	LL 2	1.1		C		3101.267	6521.008	57.972	-2349.369	-32.498	155.976	80.133	285.329	361.172	242.101	-0.777	53.093	MAX.MT
1	3	LL 2	3.1		C		3101.267	5950.595	49.905	-3870.472	-54.010	189.789	64.763	251.516	376.541	234.724	-0.777	53.093	MAX.VT
1	3	LL 3	4.1		C		3206.461	4525.169	46.290	-5055.682	-70.154	237.153	73.908	217.301	380.546	222.640	-0.777	54.851	MAX.VP
1	3	LL 3	5.1		C		3206.461	3511.101	31.949	-5435.958	-75.532	259.695	84.154	194.759	370.300	299.821	54.010	54.851	MAX.ML
1	3	LL 3	5.1		C		3206.461	3511.101	31.949	-5435.958	-75.532	259.695	84.154	194.759	370.300	299.821	54.010	54.851	MAX.VL
1	2		4.1				2154.394	3495.467	52.721	-3998.640	-61.275	163.536	33.467	147.030	277.099	156.960	-0.598	36.977	MAX.P3

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE				* BAR REINFORCEMENT STEEL *					SECTION CAPACITIES *			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC
17.500	17.500	5.500	0.997	1.19	21 # 9	@10.000	TOP TRAN	260.051	59.337	118.675	49.166	0.000
				1.35	19 #10	@11.000	BOT.LONG	305.318	60.785	121.569	50.365	0.000

NUMBER OF PILES = 16 BP = 2.500 DP = 2.500